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Vivian, Roxana Hayward

A brief study of state  
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*Supplement to R. Vivian*

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UNIT OF  
AMERICAN STATISTICAL ASSOCIATION

A BRIEF STUDY  
OF  
STATE DISTRIBUTION OF  
COLLEGE STUDENTS

BY  
ROXANA H. VIVIAN, Ph.D.  
DEPARTMENT OF MATHEMATICS  
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*Box 162*

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JAN 11 1925

## STATE DISTRIBUTION OF COLLEGE STUDENTS

TABLE III

Classification of States  
by  
Student Attendance and by Population

Per cent- of attendance in private and Recreation Schools	Number of States having this per cent of attendance in																							Number of States having this per cent of attendance in 1920-21
	None	1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	101-110	111-120	121-130	131-140	141-150	151-160	161-170	171-180	181-190	191-200	201-210	211-220	221-230
0.0	1	7	19	13	5	1	8	—	3	5	—	8	74	4	1	2	2	6	9	3	4	2	—	—
0.5	18	34	18	11	24	23	21	17	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
1.0	13	1	3	7	6	4	6	15	5	12	18	5	8	8	10	3	8	10	4	15	4	11	8	—
1.5	3	3	2	7	—	4	2	6	1	2	6	1	—	6	1	4	5	3	2	2	3	9	5	—
2.0	2	2	—	3	1	3	1	2	1	3	1	—	2	8	2	1	3	2	3	1	5	2	6	—
2.5	—	1	2	2	1	—	3	4	—	3	3	2	4	2	—	1	2	3	3	2	1	—	6	11
3.0	—	—	—	2	—	1	1	3	1	3	3	4	—	—	1	2	—	1	1	3	3	4	5	—
5.0	—	—	2	2	—	2	4	—	1	—	—	—	—	2	—	1	4	3	2	—	2	3	2	—
8.0	1	—	1	—	1	—	1	—	1	—	3	1	—	—	1	3	2	—	—	5	1	2	—	—
15.0	—	—	2	2	—	2	1	—	1	—	2	1	—	3	—	3	1	2	1	2	—	—	—	—
80.0	1	1	—	1	1	—	1	1	—	1	1	—	1	1	—	1	1	—	1	—	—	—	—	—
Total	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49
Percent from College State	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Percent from outside State	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

\* College state and residence state coincide  
\*\* College state and residence state are different

## State Distribution of College Students

In order to use material that would be of interest to a class having instruction in statistical methods, a study of the state distribution of college students was begun, and the instructor was led to extend the investigation to include twenty-three institutions. The material used represents conditions in several types of institutions and shows certain general features in regard to student residence which warrant their presentation to those who are interested in college education in general or in these institutions in particular. This report is only suggestive, for the figures used were for 1920-21 only, and certain questions that arose as the material was being handled could not be answered without securing fuller information for a series of years from practically all the institutions in the United States which are registered as colleges or universities.

The Registrars of twenty-three institutions sent replies to the request for official information in regard to student residence, and figures showing the residence of all American college students for the same year were taken from Bulletin 1922, No. 18, of the Bureau of Education. The addition of the state population figures of the 1920 Census completes the list of material used, and these figures are given in Tables I and II. So far as is known, no summer school students are included in the data, but the figures for some of the colleges include graduate as well as undergraduate students. Attention is called to this fact in Table II. A study of two sets of figures obtained from Harvard University, giving the complete university registration in one case (5,377 students) and of Harvard College (2,476 students) in the other, showed a small difference in geographical distribution and in calculated values that did not seem important, and the Harvard University figures were used. This decision was made largely because the official figures for Yale University included graduate students and could not be corrected. Of the private institutions in the list six admit as undergraduates men only, five are for women only, two are for women undergraduates in connection with men's universities, and four are co-educational. The six state universities are of course co-educational.

As far as possible the tables are arranged in alphabetical order for convenience in finding values. To facilitate comparisons and to make computation work as brief as possible, the percentages included in Tables I and II have been used throughout, and have

been grouped together in classes in Table III. The classes were varied in size because the percentages were massed at certain points and had large differences at others. The figures showing the state population of the 1920 Census and the general student attendance given in Bulletin No. 18 were included in Table III for purposes of comparison. Table III also includes for each college the percentage of students residing in the state in which the college is located and the percentage residing in other states. The figures which show the students registered in the twenty-three colleges as a single group are presented as material of some interest in considering the particular ones selected, but they have little bearing on the general questions of student residence and attendance. It should also be borne in mind that the figures for the different institutions, and for the whole student group, would vary for different years, and those used merely furnish a general indication of the distribution of students by states for these particular colleges and universities.

Tables I, II, and III bring out certain features in regard to the relation of different states to these colleges, or of these colleges to the forty-nine states (including the District of Columbia). The first horizontal line of figures in Table III shows the number of states from which no students registered at these particular colleges during the year 1920-21. Radcliffe College, with no students present that year from twenty-three states, and Brown University, with none from nineteen states, evidently drew largely from home and neighboring states. The following states (Table II) sent students to each one of the twenty-three colleges that year: California, Connecticut, Illinois, Maryland, Massachusetts, Michigan, Minnesota, New York, Ohio, Pennsylvania, and Wisconsin. The states which sent to all but one were: Colorado, District of Columbia, Indiana, Kentucky, Maine, Missouri, New Hampshire, New Jersey, North Carolina, Rhode Island, Vermont, Virginia, Washington, and West Virginia. Table II shows that there was a high percentage of attendance for at least one state in each college. New York is a special case, for it not only sent a high percentage to those of its own institutions included in this list, Barnard, Columbia, Cornell, and Vassar, but sent more to Bryn Mawr and Princeton than their home states did. In 1920-21 Bryn Mawr received 25.33 per cent of its students from Pennsylvania, but 26.66 per cent came from New York. New Jersey sent to Princeton 19.26 per cent of the students there registered, while New York sent 26.69 per cent. Massachusetts sent a high percentage to the twenty-three colleges, but seven of the group were in the state. Arizona, Idaho, New Mexico, and Wyoming each sent under ten per cent to the group of twenty-three institutions, and Nevada sent only five students.

The following summary of the information which these tables furnish as to the extent to which these institutions draw students

from within or without the state in which they are located can be made. The only institution having a figure under twenty for its highest per cent from any state was Wellesley. The highest per cent for Bryn Mawr, Dartmouth, Princeton, and Smith was between twenty and thirty; for Mount Holyoke, Vassar, and Yale, between thirty and forty; for Brown, Harvard, Massachusetts Institute of Technology, and Oberlin, between forty and fifty; for Cornell, Johns Hopkins, and Michigan, between sixty and seventy; for Barnard, Columbia, Illinois, Pennsylvania, Radcliffe and Wisconsin, between seventy and eighty; and for Boston and Minnesota Universities, between eighty and ninety. Stated more briefly and from a different angle, in 1920-21 no state sent over thirty per cent of the students registered at Bryn Mawr, Dartmouth, Princeton, Smith, or Wellesley; a single state sent between thirty and sixty per cent of the students registered at Brown, Harvard, Massachusetts Institute of Technology, Mount Holyoke, Oberlin, Vassar, and Yale; and a single state sent over sixty per cent to Barnard, Boston University, Columbia, Cornell, Illinois, Johns Hopkins, Michigan, Minnesota, Pennsylvania, Radcliffe, and Wisconsin. In comparison with these figures it is interesting to note that the highest per cent in state population in 1920 was 9.83 and in general student attendance in 1920-21 was 11.20, both percentages being for New York.

Further details in regard to the distribution of students in each state and in each college that are of interest to those connected with the different colleges can be noted in the tables, but general or consistent characteristics cannot be extracted from them as they stand. For instance, Michigan, which in 1920-21, drew students from every state, enrolled that year 64.00 per cent from the home state. Brown drew a much lower figure, only 42.52 per cent, from Rhode Island, but failed to draw students from nineteen states. Bryn Mawr, Dartmouth, Princeton, Smith, and Wellesley are seen to lead in the small percentages attending from home states, but one feels very uncertain<sup>1</sup> about their relative rank in geo-

<sup>1</sup> Because of these inconsistencies, and because the material was limited and considered more from the standpoint of the colleges than of the states, no attempt has been made to deduce any statements similar to the following interesting points in the general situation brought out by Dr. Zook in Bulletin No. 18, p. 1: "This study of the residence of university and college students reveals conclusively for the first time that the proportion of students to population is greatest in the States west of the Mississippi River, and lowest, as would be expected on account of the large Negro population, in the Southern States. In other words, although the larger and more famous institutions are usually found east of the Mississippi River and north of the Ohio River, they do not draw as large proportions of their population into colleges and universities as do the western states."

"Another interesting fact is that the well-developed middle Western and far Western States exceed the other States in the proportion of their students that are taken care of in their own institutions. The average for all the States is 74.9 per cent. In other words, taking the country as a whole, three students out of every four go to college or university in their home state."

"Notwithstanding the fact that some of the Eastern States do not have a high proportion of their students in their own institutions, they have great drawing power on students from other States. The States which are conspicuous in drawing more students to their institutions than they have students in college anywhere in the country are Oregon, California, Colorado, New York, Illinois,

graphical distribution when one sees that they have no attendance from thirteen, eight, two, six, and three states, respectively.

Graphic illustrations of the material indicate in much the same way as the tables do the individual differences of the colleges, or emphasize the extent of attendance from different states. The Princeton figures give perhaps the most material for comparison, and have been combined with figures taken from Table I to make up a form (Chart I) that shows by states the relative percentages for the Princeton student distribution, the general student distribution, and the United States population distribution. Charts of this *genre*, made for other institutions, would emphasize their pertinent characteristics. The Princeton chart shows clearly the unusually high percentages of students that Princeton University receives from three different states.

Maps I, II, III, IV, V, constructed with special shadings in accordance with the classification of Table III, show the class percentage belonging to each state for the United States population, the general student attendance and the attendance at three institutions—Bryn Mawr, Yale, and Minnesota—which were chosen as illustrations because of their distinctly different distributions. Maps I and II are much alike, as would be expected from the similarity of percentages by classes of the state population and the general student attendance in Table III. The Bryn Mawr map, in spite of no attendance from thirteen states, seems to show more even distribution in student attendance than Maps IV and V, representing Yale and Minnesota, when it is compared with Maps I and II.

Considerable information about state distribution can be gathered from these maps; and one can be made for each institution. The heavy black coloring indicates that a very large number of students, more than fifty per cent, were enrolled from the state so colored. Naturally only one state in a chart can have that color. Princeton is the only college among those considered which can have three states in the next highest shading, and those are neighboring states of large population. Mount Holyoke and Vassar each have three states in the next class, representing from eight to fifteen per cent of attendance, and Vassar has three states in the next class, five to eight per cent.

Such maps emphasize the lack of attendance in some states (as is also done in the first horizontal line of Table III) and the heavy attendance from the state in which the college is located. They grade somewhat the varying attendance from other states, but it should be noticed that they give little information about the proportion of the state population to the student attendance at col-

New Hampshire, Massachusetts, Michigan, Pennsylvania, and Virginia. The states which are not taking care of as many students as reside in those States respectively are Idaho, Montana, South Dakota, Wyoming, Connecticut, North Dakota, Oklahoma, New Jersey, Maine, West Virginia, South Carolina, Mississippi, North Carolina, Arkansas, Kentucky, Alabama, Florida, Texas."

lege, for with the shading by classes instead of by individual shading, maps like III, IV, and V cannot be compared to any great extent with Maps I and II. For example, a large number of students from some state may attend a college and give it a special shading in the map for that college, but the number of students from a state of nearly the same population and about as far away from the college may be small and give a very different shading. In 1920-21 Illinois with a state percentage of 6.14 sent 0.79 per cent of the students registered at Princeton, while Ohio sent 3.79 per cent of the Princeton students and had a state population of 5.45; i.e., Ohio, less than Illinois by 0.69 per cent in state population, sent 3.00 per cent more students to Princeton that year.<sup>1</sup> In Map I the two states have the shading of the seventh class, but in a Princeton map Illinois would show the shading of the second class and Ohio of the sixth. The two states are much the same in size of population but not in their relation to different colleges.

From the cumbersome group of original figures, which, even when gathered into classes with maps and charts based upon them, do not lead to very definite information, we turn to the problem of obtaining single numerical values which will measure to some extent the relation of the number of students registered from a state in any year to the population of that state in the nearest census, and which will place the colleges in some acceptable order with respect to the geographical distribution of their students. The median, semi-interquartile range, and relative interquartile range were calculated for each college but, with the percentages so massed at one extremity and the variation toward the other so irregular, these values, derived from particular percentages, could not be expected to be truly representative. They do not seem valuable enough to include in the final lists of computed values. The probable errors, which seem of no importance for this particular material, have also been omitted.

Since the forty-nine elements used for each college were percentages, the computed average was the same for each one, namely, one forty-ninth of one hundred per cent, or 2.04 per cent. This figure was used in all computations. With the percentages and the average carried to two decimal places, the computations of the average deviations, standard deviations, and correlation coefficients<sup>2</sup> were carried to four places before setting down the values

<sup>1</sup> Attendance at the University of Chicago may be a substantial factor in the variation here, but to Smith College Ohio sent 5.58 per cent, while Illinois sent 6.77 per cent. For Wellesley College the respective percentages are 5.43 and 5.61, and for Dartmouth College, 5.28 and 5.02.

<sup>2</sup> The use of percentages means that the exact number of students in a college does not have as much weight in any computation as does the proportional distribution and explains why a college with a small number of students present can have a large correlation coefficient.



in Table IV.<sup>1</sup> No Census correlation coefficient appears as the Census deviations were used as the associated series in each computation of the coefficient.

As the formulas show, the quantities in the three columns in Table IV were computed from the same values, namely, the deviations from the average, but by quite different processes. They apparently have little connection with each other for this material. The deviations from the average, however, would naturally be connected with the number of students coming from states other than the one in which the college was located. This percentage of students who came from outside states was used to determine the length of the bar which represents each college in Charts II *a, b, c, d*. These charts were made up from Table IV to show in what order the colleges would stand if arranged by number of states having no attendance, or by size of average deviations, standard deviations and correlation coefficients, all but the last chart having the list arranged in increasing order of magnitude. The general student group and the group of twenty-three colleges were included in these four charts and occupy the same position in each one, the general student group leading.

The colleges which show in these figures the closest resemblance to the twenty-three colleges taken as a single group are Princeton, Smith, Vassar, and Wellesley. Smith and Wellesley more in their average deviations, and the other two in their correlation coefficients. Chart II-*a* adds nothing new in information, but brings out graphically and compares what is contained in the top and bottom horizontal lines in Table III. Princeton and Wellesley are about where we should expect them to be in this chart; Michigan and Brown are out of place as previously noted; and many others show lack of connection between number of states represented and percentage of outside attendance.

Chart II-*b* shows that the order of average deviation follows somewhat the order of outside attendance, but Harvard, Massachusetts Institute of Technology, Yale, Johns Hopkins, and Oberlin are noticeably higher than their outside attendance would warrant, while Brown is decidedly lower. The reasons for this lack of connection between outside attendance and deviation from the average are distinctly individual, and would be apparent to those personally acquainted with the different colleges. They depend

<sup>1</sup> These computations were made by the writer and were checked by members of a class in Statistics at Wellesley College, or by using a second method of calculation. The following formulas were used in which  $x$  represents the deviations from the average of one series, and  $y$  of the associated series: average

$$\text{deviation} = \frac{\sum (x)}{n}, \text{ where all the } x \text{ values are regarded as positive, and a}$$

$$\text{similar form for the } y \text{ values; standard deviation} = \sqrt{\frac{\sum (x^2)}{n}} = \sigma_x;$$

$$\text{and correlation coefficient} = \frac{\sum (xy)}{n \sigma_x \sigma_y} = r.$$

upon the relation that outside attendance has to the state population, to the position or the special characteristics of the college, or to those indefinite factors which induce the choice of a college. The chart suggests that the average deviation is really a composite measure of geographical distribution. The selection of this value, or of the number of states having no attendance, as the numerical measure for the determination of order seems unwarranted. The choice then lies between the standard deviation and the correlation coefficient.

Chart II-*c* shows that the standard deviation varies almost directly as the outside attendance, and may be regarded to a certain extent as a measure of that attendance. The slightly exceptional cases are Princeton, Bryn Mawr, and Brown, which draw heavily from neighboring states but without an accompanying proportional increase in their standard deviations because of the type of distribution they have among other states.

In Chart II-*d* it is Cornell, Barnard, Columbia, and Pennsylvania, colleges in high population states, that appear most out of order. Brown is very low in its correlation coefficient compared to its outside attendance. Other institutions are not in the places their outside attendance would lead us to expect.

Since in the question under consideration we should wish to emphasize outside attendance as much as possible, it seems after a preliminary study of these charts that the standard deviation should decide the precedence of any two colleges as to rank in a list showing geographical distribution. If, however, one makes an analysis of the formula for the correlation coefficient, the fact is brought out that not only is the influence of the standard deviation for each group embodied in it, but the numerator of that coefficient involves the deviations in such a way as to include the influence of outside attendance upon the college, not as a whole, but divided into forty-nine separate parts and in combination with the corresponding deviations for the Census. This is something which the standard deviation cannot do as the two formulas indicate.

The standard deviation,  $\sigma_x = \sqrt{\frac{\sum (x^2)}{n}}$ , includes only the deviations,  $x$ , of the college percentages from the average; the correlation coefficient,  $r = \frac{\sum (xy)}{n \sigma_x \sigma_y}$ , includes these values and also

a corresponding set,  $y$ , for the state population of the 1920 Census. The size of the coefficient depends simply on the  $\sum (xy)$  in the numerator and the  $\sigma_x$  in the denominator, for the factor  $n \sigma_y$  in the denominator remains the same ( $49 \times 1.98$ ) for all the coefficients in this discussion.

According to this formula, if the registration of state attendance in each college was in exact proportion to the population of the state, i.e., 9.83 per cent of its students coming from New York,

8.25 per cent from Pennsylvania, etc., all the standard deviations would be equal, and the correlation coefficients approximately unity. For the different colleges, every change in the state percentages, or  $x$  values, changes both numerator and denominator, but not necessarily in the same direction. This explains why one college with a smaller numerator than another may have the larger correlation coefficient. For example, Vassar and Barnard are in the same state. Vassar draws percentages from states that make the sum of the products of the corresponding deviations of the college and of the Census equal to 354.76, while Barnard's figure is 578.72. Vassar has a standard deviation of 4.88, while Barnard has one more than twice as large, namely, 9.98. This makes the correlation coefficient of Vassar, with its smaller numerator, .750, and that of Barnard .599. Columbia with  $\Sigma(xy)=620.94$  and standard deviation 10.81, both larger than the values for Barnard but very close in proportional change, has a correlation coefficient of .593.

It is evident that if the highest deviations in the Census figures are combined with the highest deviations in the college figures, in other words, if the college draws large numbers from high population states, even with a high standard deviation showing the effect of its low attendance from many other states, it may have a somewhat higher correlation coefficient than would be expected. This is the case for Barnard, Columbia, Cornell, and Pennsylvania. They have high standard deviations, low outside attendance, and drew small numbers from several high population states, but draw a large percentage from their own high population states. Illinois and Boston Universities are somewhat similar examples. Bryn Mawr, Vassar, and Princeton move up from the places their standard deviations would give them. Smith, Dartmouth, and Brown have moved down. The comparatively small size of their standard deviations is offset by their failure to draw very largely from the states with high populations, their highest deviations coming from states which have a low or medium population in the Census list.

Evidently residence of students fairly well distributed with respect to the population of the states, and the location of the college in one of a group of states having high population, will ensure a high correlation coefficient, as in the case of Bryn Mawr College, while reversed conditions lead to the opposite result for the University of Minnesota. The correlation coefficients in the cases of institutions having a mixed combination of these two geographical factors, or having special features affecting their choice by students, may fall anywhere between the two extremes.

In spite of these uncertain values, there seems to be no better single numerical measure, or representative value, for the colleges than this correlation coefficient, if one wishes to place them in the order in which they draw students from different states in

proportion to the population of the states, or to consider other questions that involve proportional geographical distribution. This value has been chosen and the order for the group of twenty-three colleges, according to this measure, is the same as that shown in Chart II-4, or by the following values of the correlation coefficient taken from Table IV:

Bryn Mawr College.....	.82
Vassar College.....	.75
Princeton University.....	.74
Wellesley College.....	.69
Cornell University.....	.65
Smith College.....	.65
Barnard College.....	.60
Columbia University.....	.59
Pennsylvania University.....	.51
Mount Holyoke College.....	.48
Oberlin University.....	.46
Dartmouth College.....	.44
Harvard University.....	.35
Yale University.....	.32
Illinois University.....	.32
Massachusetts Institute of Technology.....	.30
Michigan University.....	.22
Radcliffe College.....	.18
Boston University.....	.12
Wisconsin University.....	.08
Brown University.....	.08
Johns Hopkins University.....	.03
Minnesota University.....	.02

Two reasons for the size of these coefficients have been suggested—location of the college and student selection of a college. These two reasons overlap and apply in different ways to different institutions. Certain general characteristics can be mentioned.

If a college is situated in or near a large city which affords accompanying advantages in music, drama, art, special libraries and special facilities for practical work in several courses, many students with varying interests are drawn to that college from a very wide area. If it is a college on the Atlantic coast, attendance by students from the middle west, or from more distant states, makes it possible for them to arrange economically for visits to Europe during or after their college course. Many students enter with this plan for wider knowledge of world affairs in mind. It is probable that such elements in the location of a college have a considerable, but not a measureable, difference in student attendance.

The geographical nearness of a student to his college seems less of a determining factor than might be expected, although for many

colleges it has great weight. Even in cases where economy has to be considered, the cost of a college near home may be more than the board, tuition, and travelling expenses he incurs, if he chooses a more distant one, where he may secure a scholarship. That a student's choice is very often independent of distance is shown in the great variation that appears in the number of students who choose to attend an institution in their own or a neighboring state. If we take from Table I the population figures for New York, Mississippi, New Hampshire, Vermont, and Delaware, 9,83, 1,69, 42, 33, and 21 per cent, respectively, and compare student distribution with these figures, we find that in 1920-21 New York sent 72.6 per cent of its own student residents to New York institutions, Mississippi, 94.3 per cent (the highest number) to Mississippi institutions, New Hampshire, 33.1 per cent (the lowest number), to New Hampshire institutions, Vermont 64.0 per cent to Vermont institutions, and Delaware 78.6 per cent to Delaware institutions. Looking at the college distribution in Table II, students from every state are seen to attend one college, while another college near at hand has only a small number of students who reside beyond its immediate neighborhood. The possibility of special professional training outweighs the distance factor in many such cases, as is indicated by the percentages of students from Arizona and Texas who appear at the Massachusetts Institute of Technology. Evidently the individual student is not influenced in any measureable way in choosing a college by the fact that it is located in or near his own state, and for individual colleges the choice by students is greatly affected by the advantages already mentioned and by more personal reasons.

One thinks of these more personal reasons under two groups. The first group would include matters connected with health, nearness to relatives, the fact that a college has been, or is being, attended by relatives or friends, some of whom may be members of the faculty or administration, a parent's desire that son or daughter attend his or her own college, opportunities for collegiate sports, interesting social life, the enjoyment of a beautiful campus and splendid buildings, or connection with some religious foundation. The second would contain the truly academic reasons which form by themselves a group of great importance to the college as well as to the student. All of these factors enter into a student's choice in varying degrees and have their effect in the correlation coefficient in much the same way that weather conditions affect the thermometer. One can seldom predict numerically the results arising from their presence. The reasons in the second group, and several of those in the first, have a rather general influence upon a student's decision, and depend very much upon the amount and type of publicity fostered by different colleges.

From the point of view of the college faculty it is the academic

reasons for choice which are most essential and desirable, but the definite knowledge of the academic advantages of an institution, upon which these reasons depend, is not often covered by the type of college publicity that is most familiar. Newspaper articles, accounts of athletic games, drives for funds, activities with graduate clubs, Princeton Clubs, Wellesley Clubs, Dartmouth Nights, etc., etc., play their part in spreading information over wider and wider areas, thus drawing students more in proportion to the population of the states; but the reasons arising from such publicity are not so purely academic as issue from official information, circulated more quietly at the call of a student, his parent or instructor, and followed by wise advice as to which institution will best fit his ability as a scholar. In some cases this information comes through conferences with teaching graduates of a college, but it often happens that parents or teachers who are not graduates of the college in question are familiar with its aims, equipment, and activities and with the necessary details of entrance requirements. These latter are sometimes attended to so late that a student cannot meet them at the college he most desires and has to go elsewhere, but the questions of high, low, or special entrance requirements, or preferential admission do not affect many students.

If by this academic type of publicity colleges are known all over the country to have strong and well-arranged courses, splendid laboratories, scholarships and fellowships for students of ability, able professors whose teaching power and research publications are well known; and if students of ability, general or special, are carefully directed by their parents or instructors in preparatory schools, public or private, as to the best place for their four years of college life; academic reasons have an opportunity to play a substantial part in the decision of a student. Knowledge of such advantages and of the possibility of recommendation to a graduate scholarship or fellowship, if his academic standing as an undergraduate is of high grade, can at the same time be of great assistance in bringing the best class of minds to a college.

The college which has made use of any type of publicity has evidently increased its correlation coefficient by that means, since it has had the opportunity of drawing percentages of students from the several states more in accord with their population. The unexpected size of the coefficient for certain colleges among the twenty-three considered must have arisen partly from such distribution of information. Certainly a college which wishes to increase its coefficient in an advantageous way should consider the dissemination of the right kind of information through all available and at the same time advisable channels.

A correlation coefficient assuredly has many factors in it and their weight does much to determine the advantages of the coefficient, whether it is high or low. If a high correlation co-

efficient means, as it can, that a college has chosen the best students from all over the country, a double advantage is secured for both students and faculty. In the class-room there are students who have more than average ability for undergraduate work and promising possibilities for graduate and research work. In addition to this inspiration for progressive scholarship, the presence of comrades from all parts of the country as part of their undergraduate experience can lead, at the end of four years, to a broader, more tolerant, more enlightened personal, national, and even international point of view than would otherwise be the case.

From whatever areas the students come, there are few colleges to-day which can increase their numbers, or even fully and suitably accommodate their present numbers in dormitory or class-rooms; yet there are still large and eager groups of expectant students knocking at their doors. To choose from these groups as many of the abler students as a college can handle, and to have the right accommodations for their academic life and work, is becoming a serious problem. Administrative officers and trustees who have to face this question on the financial side find a high correlation coefficient a great boon. It means to them that graduates of the college are generally in closer touch with possible donors and sources of revenue all over the country than graduates from a college with a low coefficient, and that a larger number of interested people can be reached on behalf of the college. The steps which are being taken in many institutions to deal with this problem will eventually increase the size of the coefficient, and if these steps are taken primarily for academic reasons, as one believes they should be, financial advantages are almost certain to materialize with little or no delay.

If we agree that suitable publicity is the best and strongest agent for increasing proportional distribution of the residence of college students, and consequently the size of the correlation coefficient which gives a single numerical measure of this geographical distribution; and if the colleges require that only students best fitted for their courses shall enter; the responsibility for publicity comes very definitely to the doors of the Boards of Admission of the colleges. In almost any institution such boards can send suitable and interesting information to all preparatory schools, to all teaching graduates, and to all graduate clubs and organizations. In cooperation with them the faculty and administration can give special attention to publicity of the best kind, and use every opportunity to have promising students receive it in printed form or by personal conference. The establishment of scholarships of suitable amount for brilliant students who cannot meet the expense of four college years cannot be arranged as easily as proper publicity, but is a subject that should receive special attention. Above and through all such efforts to secure a high, and at the same time valuable, correlation coefficient is the necessity of securing and maintaining the best teaching, the best equipment, and the most worthily progressive plans for college work.

**TABLE I**  
Distribution of Attendance  
of  
General Student Group\* in 1920-21 and State Population in 1920

State	Students Attending Institutions in the State							Students who Reside in the State		Per cent of State Population in 1920
	Total Number	Residents of State		Residents of Other State		Students who are Residents of Foreign Countries or American Possessions				
		Number	%	Number	%	Number	%	Number	%	
Alabama	4354	3650	84.5	649	14.9	25	.6	5299	12.0	2.22
Arizona	1171	835	71.3	318	27.1	18	1.6	1174	.27	.31
Arkansas	2020	1830	90.5	189	9.3	1	.2	3094	70	1.66
California	22460	18417	81.9	3407	15.1	636	3.0	20461	44.6	3.25
Colorado	6226	3928	63.0	2232	35.8	66	1.2	5302	12.1	.88
Connecticut	4738	1955	41.8	2671	56.3	82	1.9	5568	12.7	1.31
Delaware	402	316	78.6	85	21.1	1	.3	699	.16	.21
Dist. of Columbia	9718	3351	34.7	6049	62.2	288	3.1	4600	10.5	.42
Florida	1760	1528	86.8	242	13.5	10	.7	2588	.59	.82
Georgia	6614	4670	70.6	1884	28.4	60	1.0	6078	13.8	2.73
Idaho	1304	1102	84.5	195	14.9	7	.6	2383	.54	.41
Illinois	34935	22683	64.9	11267	32.2	985	2.9	28887	6.57	6.14
Indiana	14911	11246	75.4	3374	22.6	291	2.0	15548	3.53	2.77
Iowa	17068	14853	87.0	1998	11.7	217	1.3	18867	42.9	2.27
Kansas	10494	9335	88.9	1109	10.5	50	.6	1786	2.68	1.67
Kentucky	3730	3042	81.5	658	17.6	30	.9	4855	1.10	2.29
Louisiana	4338	3121	72.0	1101	25.4	111	2.6	4156	9.4	1.70
Maine	2391	1917	80.1	461	19.3	13	.5	2966	.67	.73
Maryland	4319	1892	43.8	2281	52.8	146	3.4	3409	.78	1.37
Massachusetts	24136	11924	49.4	11410	47.2	802	3.4	16072	3.65	3.65
Michigan	17208	12208	71.3	4444	25.8	479	2.9	14757	3.35	3.47
Minnesota	12561	10579	83.7	1900	15.1	142	1.2	12953	2.95	2.26
Mississippi	3482	3287	94.3	191	5.4	4	.3	5078	1.15	1.69
Missouri	14101	10947	77.6	2999	21.2	155	1.2	13996	3.18	3.27
Montana	2191	1902	86.8	269	12.2	20	1.0	2972	.68	.52
Nebraska	2861	7042	85.2	1179	14.2	40	.6	8607	1.96	1.23
Nevada	599	341	57.0	207	34.0	11	2.0	465	.11	.08
New Hampshire	2488	945	38.1	1566	66.2	17	.7	1865	.42	.42
New Jersey	4199	1957	46.6	2187	51.9	85	2.0	10744	2.44	2.99
New Mexico	524	330	62.9	166	32.9	8	1.7	709	.16	.34
New York	55310	40036	72.6	13627	24.7	1467	2.7	49262	11.20	9.88
N. Carolina	6902	5875	85.1	990	14.3	37	.6	7720	1.76	2.42
N. Dakota	1792	1512	84.3	271	15.1	9	.5	2523	.57	.62
Ohio	25222	23508	93.2	4256	15.0	458	1.8	29617	6.73	5.65
Oklahoma	6356	5718	90.1	428	6.7	10	.2	7709	1.75	1.92
Oregon	8015	5992	74.8	1844	23.0	179	2.2	7020	1.60	.74
Pennsylvania	36262	27412	75.5	8259	22.7	591	1.6	34491	7.84	8.25
Rhode Island	2184	1346	61.6	831	38.0	7	.4	2173	.49	.58
S. Carolina	5517	4922	89.2	577	10.4	18	.4	6350	1.42	1.59
S. Dakota	2322	2090	90.0	218	9.3	14	.7	3379	.77	.60
Tennessee	4359	2197	50.4	2100	48.1	62	1.5	3574	.88	2.21
Texas	10875	9918	91.3	609	5.5	48	1.5	12500	2.91	4.41
Utah	3276	2741	83.6	495	15.1	40	1.3	3283	.75	.43
Vermont	1671	1070	64.0	559	35.8	12	.8	1724	.39	.33
Virginia	8266	5374	63.3	3174	36.7	78	1.0	7296	1.66	2.19
Washington	8588	6436	75.0	1328	15.4	324	3.9	8780	2.00	1.29
W. Virginia	3249	2722	83.7	508	15.4	24	.9	4490	1.02	1.38
Wisconsin	11710	8495	72.8	3238	27.7	177	1.5	10603	2.41	2.49
Wyoming	493	393	79.7	98	19.8	2	.5	906	.21	.19
Total	468267	329497	—	110413	—	8357	—	439910	100.00	100.00

\* These figures, representing all students attending colleges, universities and professional schools, are taken from Bulletin 1921, No. 15, pp. 2, 4, of the Bureau of Education and do not include students attending independent theological schools and teacher training institutions.

\*\* These percentages are computed from an early statement of the 1920 Census figures and have been used in all calculations of population in this paper.

**TABLE II**  
**Distribution of Residence\* of Students**

[illegible]

\* Figures given by college Registrars, or as printed in Presidents Reports or in college Catalogues.

1. Four hundred graduate students included.
2. Graduate and undergraduate registration.
3. Students in Schools of Medicine, Dentistry, Pharmacy, or in Summer Session not included.
4. From 1920-21 Register p. 401, graduates and students registered in other schools included.
5. From 1920-21 Catalogue pp. 820-821, Summer Session registration not included.
6. From 1920-21 Catalogue pp. 465-6
7. Graduate and undergraduate registration.

☐ Population Per Cent  
☒ General Student Per Cent  
☐ Princeton Per Cent

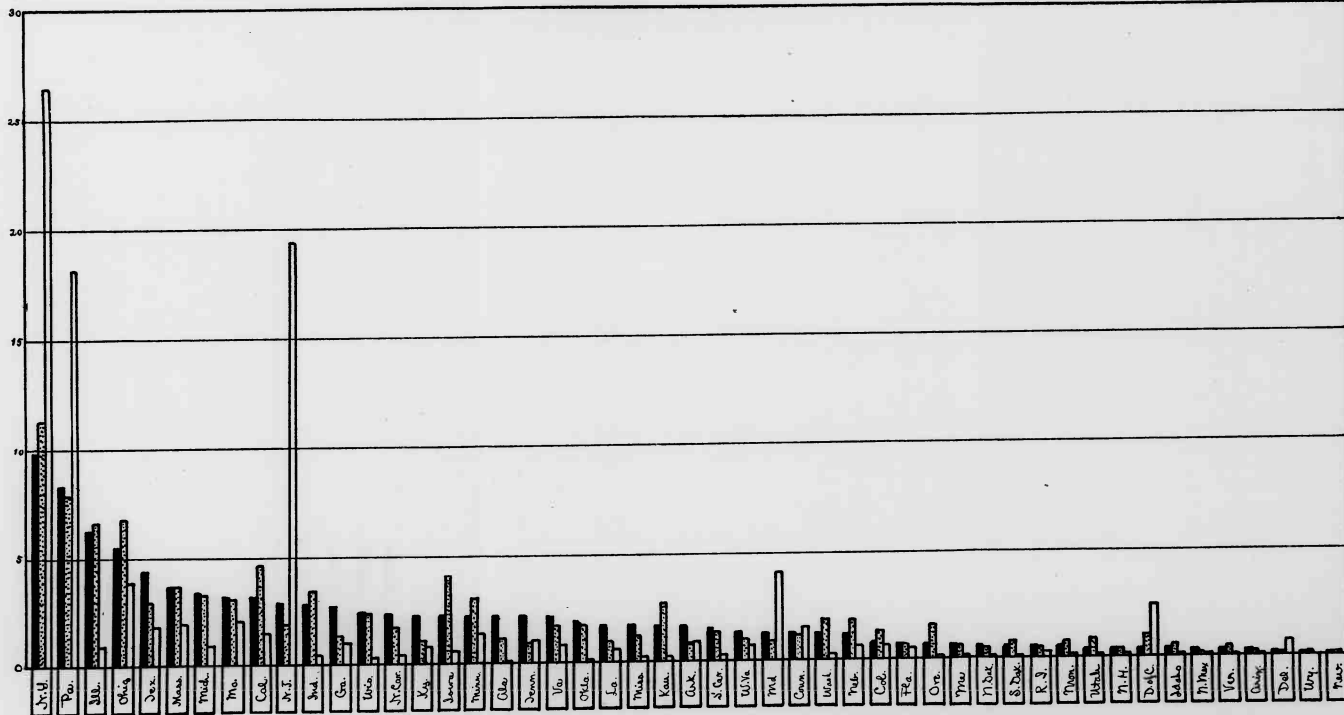
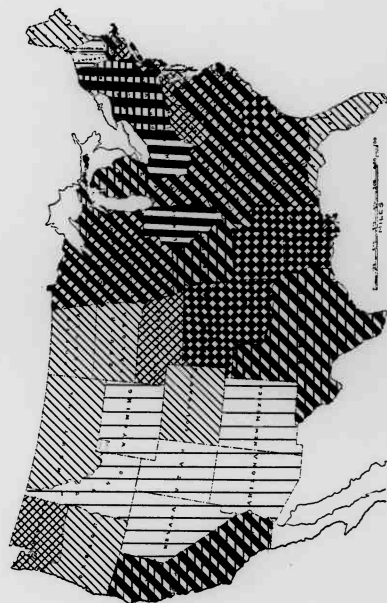


TABLE IV  
Computed Values

Population and Student Groups	Average Duration	Standard Deviation	Correlation Coefficient
1920 Census	1.377	1.98	—
Students General	1.378	2.18	.94
Students Smith Co.	2.380	3.69	-.74
Barnard College	3.069	9.98	.60
Bethu University	3.515	12.31	.12
Bowen University	3.189	6.81	-.08
Briggs Women College	2.555	5.16	.82
Chenault University	3.345	10.81	-.59
Concord University	2.963	8.87	.65
Dartmouth College	2.677	4.81	.44
Haverard University	2.321	6.11	.35
Illinois University	3.317	10.98	.32
Iowa State University	2.612	8.47	-.03
Mass Inst. Technology	2.511	6.89	.30
Michigan University	3.099	9.08	.22
Minnesota University	3.490	12.25	.02
Ind. State College	2.854	5.34	.48
Princeton University	2.613	6.69	.46
Pennsylvania University	3.232	10.14	.51
Stanford University	2.589	5.12	.74
Radcliffe College	3.180	10.56	.18
Smith College	2.438	4.22	.65
Vassar College	2.648	4.88	.75
Wellesley College	2.411	4.00	.69
Wiscousin University	3.165	10.12	.08
Yale University	2.566	5.74	-.32

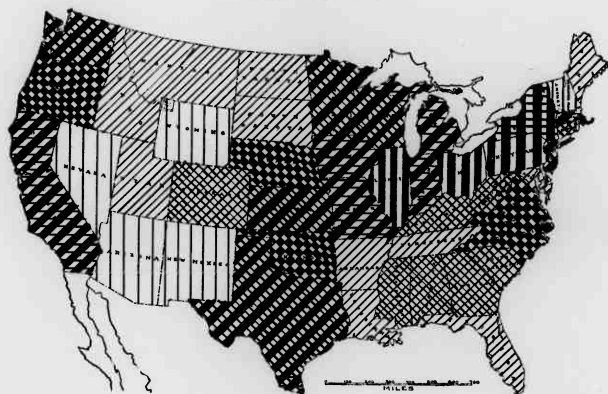
MAP I  
Distribution of State Population  
U. S. Census 1920





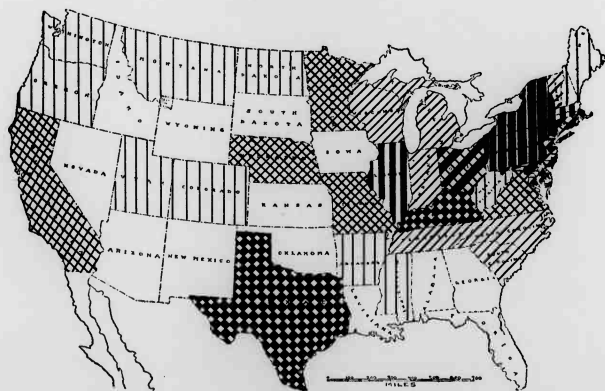
### MAP II

Distribution of Student Attendance in 1920-21  
General College Group

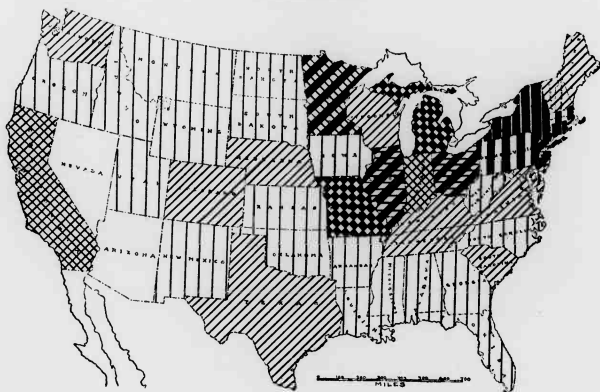


### MAP III

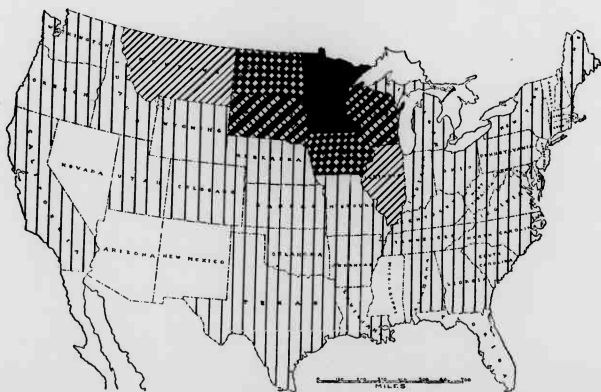
Distribution of Student Residence in 1920-21  
Bryn Mawr College



**MAP IV**  
 Distribution of Student Residence in 1920-21  
 Yale University

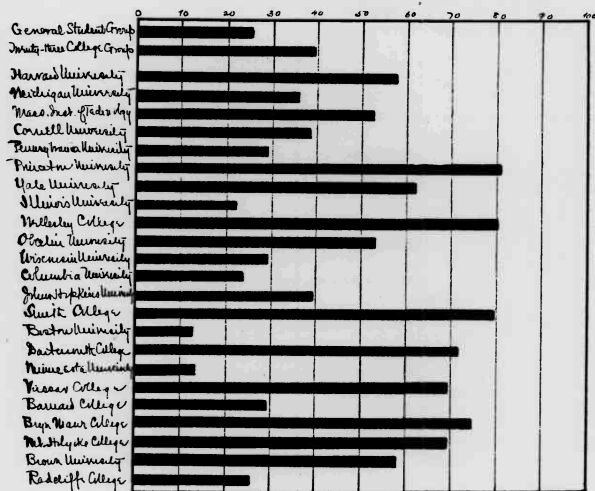


**MAP V**  
 Distribution of Student Residence in 1920-21  
 University of Minnesota



# CHART IIa

Percentages From Outside States Arranged  
in  
Increasing Order of Number of States Having No Attendance at Colleges



# CHART IIb

Percentages From Outside States Arranged  
in  
Increasing Order of Average Deviations of Colleges

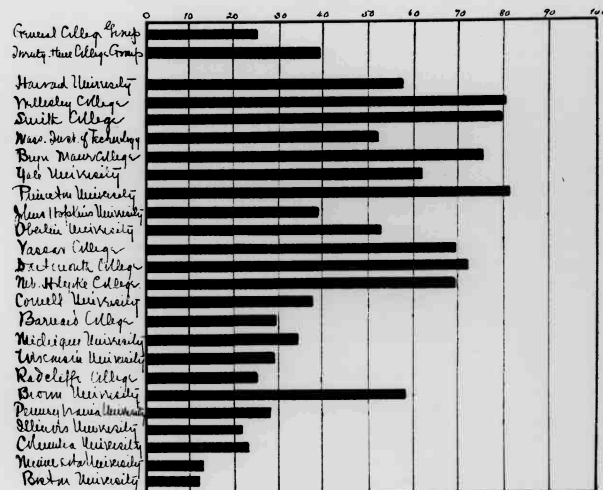


CHART IIc

Percentages From Outside States Arranged  
in  
Increasing Order of Standard Deviations of Colleges

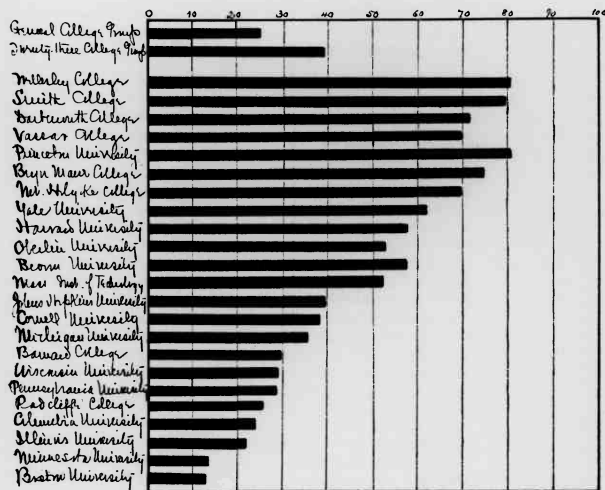
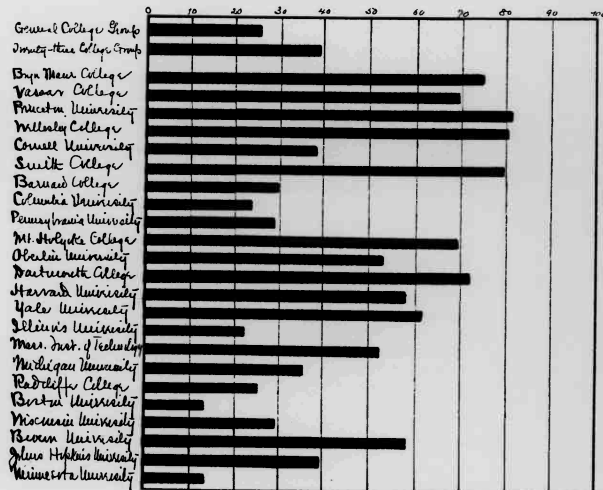


CHART IIId

Percentages From Outside States Arranged  
in  
Decreasing Order of Correlation Coefficients of Colleges



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TITLE**